

What is claimed is:

[Claim 1] 1. An imaging method, comprising the steps of:
depositing a memory material on a substrate;
forming and memorizing a first edge of the memory layer; and
memorizing a second edge of the memory layer to define a loop of sub-lithographic well-controlled image size of memory material for image transfer.

[Claim 2] 2. The imaging method of claim 1, further comprising
memorizing the first edge and second edge in an underlying material to form a
sub-lithographic image.

[Claim 3] 3. The imaging method of claim 1, further comprising protecting
a location of the second edge while memorizing the first edge.

[Claim 4] 4. The imaging method of claim 1, wherein the memorized
second edge is defined at a junction between the memory layer and a
sacrificial layer.

[Claim 5] 5. The imaging method of claim 4, further comprising
undercutting the sacrificial layer by one of chemical oxide removal and
hydrofluoric acid to define the location of the second edge.

[Claim 6] 6. The imaging method of claim 1, wherein the memorized first
edge is defined by an edge of an upper layer comprising of Ge or organic spin-on
material.

[Claim 7] 7. The imaging method of claim 1, further comprising the steps
of:
patterning an oxide layer formed over the memory layer;

etching the memory layer to define the memorized first edge using the patterned oxide layer to determine a first edge location; removing portions of the oxide layer and the memory layer between a spacer to form the memorized second edge, the spacer protecting the memorized first edge and copying the location of the second edge; and;

stripping the spacer to define the second edge and the well-controlled loop of sub-lithographic image size of memory material for image transfer.

[Claim 8] 8. The imaging method of claim 7, further comprising transferring the memorized first image and the memorized second image to an underlying material.

[Claim 9] 9. The imaging method of claim 7, further comprising stripping further portions of the oxide layer over the memory layer to move an edge of the oxide layer and to locate the second edge prior to the formation of the memorized second edge.

[Claim 10] 10. The imaging method of claim 1, further comprising: providing a resist layer over an oxide material formed on the memory layer; etching the oxide material and portions of the memory layer in a pattern formed by the resist layer, the etching forms the memorized first edge; etching an undercut in the oxide material using a chemical oxide removal (COR) process or hydrofluoric acid to form a shoulder in the memory layer partially defining the second edge; stripping the resist layer to expose the oxide layer; placing protective material over the exposed portions of the oxide layer and the shoulder of the memory layer to protect the first edge; partially removing the protective material so as to leave it between closely-spaced oxide material features, thereby protecting the first-edge but exposing the oxide layer; etching the exposed oxide layer to memorize the second edge; and

removing the protective material in order to define an image to be transferred onto an underlying layer, as defined by the memorized first edge and second edge.

[Claim 11] 11. An imaging method, comprising:
depositing a memory material on a substrate;
protecting the memory material with a protective layer;
defining a first edge in the memory layer and protecting other portions of the memory layer with the protective layer which are to be formed as a second edge; and
removing a portion of the protective layer to define the second edge in the memory layer.

[Claim 12] 12. The imaging method of claim 11, further comprising
transferring the image formed by the first edge and the second edge to an underlying layer.

[Claim 13] 13. The imaging method of claim 11, further comprising:
forming an undercut in the protective layer using a chemical oxide removal (COR) process;
conformally forming the memory layer over the protective layer and in the undercut;
etching the memory layer to form the first edge while the protective layer over the undercut protects the second edge; and
stripping the protective layer and an underlying sacrificial layer to define the second edge.

[Claim 14] 14. The imaging method of claim 11, further comprising:
stripping a portion of a sacrificial layer formed over the memory layer to define the first edge, the sacrificial layer being the protective layer;

stripping further portions of the sacrificial layer over the memory layer using a chemical oxide removal or a hydrofluoric acid to form a shoulder in the memory layer;

forming a spacer over the shoulder and portions of an underlying layer, adjacent to remaining portions of the sacrificial layer;

stripping the remaining portions of the sacrificial layer and the memory layer between the spacers to form the memorized second edge, the spacer protecting the memorized first edge; and

stripping the spacer to define a well-controlled loop of memory material.

[Claim 15] 15. The imaging method of claim 14, wherein stripping portions of the sacrificial layer comprises selectively removing a portion of the sacrificial layer.

[Claim 16] 16. The imaging method of claim 11, further comprising:
providing a resist layer over the sacrificial layer;
etching the sacrificial layer and portions of the memory layer in a pattern formed by the resist layer, the etching forms the memorized first edge while the sacrificial layer protects edge erosion;
etching an undercut in the sacrificial layer using a chemical oxide removal (COR) or selective controlled etch process to form an undercut;
placing a gap-fill material over exposed portions of the sacrificial layer and within the undercut to protect the first edge;
etching the exposed sacrificial layer to memorize the second edge; and
removing the gap-fill material in order to define an image to be transferred onto an underlying layer as defined by the first edge and the second edge.

[Claim 17] 17. An imaging method, comprising;

depositing a sacrificial material on a substrate;

depositing a capping material on the sacrificial material;

removing corresponding sections of the capping material and sacrificial material;
forming an overhang of the capping material;
depositing imaging material under the overhang of the capping material; and
removing the capping material and the sacrificial material,
thereby forming a first defined memorized edge and a second defined
memorized edge having a sub-lithographic image size.

[Claim 18] 18. The imaging method of claim 17, wherein depositing the imaging material under the overhang of the capping material comprises depositing the imaging material on the capping material, sacrificial material and substrate, and etching the imaging material using the capping material as a mask.

[Claim 19] 19. The imaging method of claim 17, wherein forming an overhang of the capping material comprises removing a portion of the sacrificial material under the capping material.

[Claim 20] 20. The imaging method of claim 17, wherein forming an overhang of the capping material comprises removing sacrificial material using one of a chemical oxide removal and hydrofluoric acid.